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BOOK REVIEWS

Non-Euclidean Geometry: A Critical and Historical Study of Its Development.
By ROBERTO BONOLA. Translated by H. S. CARSLAW. Chicago: The
Open Court Publishing Co., 1912. Pp. xii+268. $2.00.

Few, if any, of the modern developments of mathematics have struck the popular
imagination in so pronounced a fashion as non-euclidean geometry and, perhaps we
may say, deservedly so. For the discussion, which has clustered around this subject,
in which great mathematicians, philosophers, and physicists have taken active part,
has finally resulted, in our day, in a clear appreciation of the nature of such a mathe-
matical science as geometry. Bonola's book is, therefore, an admirable introduction,
not only to non-euclidean geometry, but to the vast domain of all of those important
and fascinating discussions which are concerned with the foundations of mathematics.

The historical method of presentation, adopted by the author, is particularly
well fitted for a treatment of this subject. The earliest commentators of Euclid
found it impossible to accept his treatment of parallel lines with quite the same
degree of approbation which they willingly extended to the rest of his geometry, and
for more than two thousand years countless efforts were made to *prove* the fifth postu-
late upon which his theory of parallels was based.

When Saccheri (1667–1733) attempted to prove the necessity of Euclid's assump-
tion by the method of *reductio ad absurdum*, he was on the threshold of the new
science, which was not, however, finally entered until the days of J. Bolyai (1802–60)
and Lobatschewsky (1793–1856). The history of the slow growth of this theory is
most fascinating, and is well and accurately related in Bonola's work. A *full* apprecia-
tion of the later developments of non-euclidean geometry, associated with the names
of Riemann, Beltrami, Cayley, Klein, Lie, Helmholtz, Clifford, Poincaré, and many
others, requires a larger knowledge of advanced mathematics than Bonola wishes to
presuppose. He does not, however, on that account, neglect to speak of these matters.
He attempts, in a very satisfactory way, to make his readers acquainted with the
general drift of these more modern investigations, explaining the theories in a semi-
popular fashion and giving the more seriously inclined an opportunity to get into
contact with the literature of the subject.

The translation is well done, although a few "idioms" of a decided Italian turn
seem to have crept into the English version. For instance, we hear frequently (cf. p. 6)
of two lines which "are not able to meet." It seems to be nearly impossible to pre-
serve the instinct for idiomatic English while translating from a foreign language.

Lectures on Fundamental Concepts of Algebra and Geometry. By J. W. YOUNG.
Prepared for publication with the co-operation of W. W. DENTON. With
a note on the growth of algebraic symbolism by U. G. MITCHELL. New
York, Macmillan, 1911. Pp. vi+247. $1.60.

Never, in the opinion of the reviewer, has such a clear and authoritative exposi-
tion of the fundamental notions of mathematics been presented to the general public.
There are two very good reasons for this. In the first place, although the notions of

elementary algebra and geometry have their origin in hoary antiquity and have been discussed scientifically for more than twenty centuries, it was reserved for the last few decades actually to supply us with a clear insight into the nature of the foundation of mathematics. Thus, the subject of these lectures, in spite of its long history, is fresh and modern. In the second place, there are few authors who, like John Wesley Young, combine the power of clear and simple exposition with profound insight and knowledge of the subject. The result of this fortunate combination, in the present instance, is a work popular in the best sense of the word, which enables the layman to gain an adequate idea of what is meant by the foundation of mathematical science, to acquire quite a little information in regard to some of the more important parts of the superstructure, and to survey intelligently the whole field of mathematics, so far as this may be done without intensive study.

These "Lectures" were originally delivered in the summer session of the University of Illinois in 1909, and are particularly valuable to teachers of mathematics in secondary schools and colleges, as well as to all persons interested in an attempt to define the proper sphere of deductive reasoning.

E. J. WILCZYNSKI

THE UNIVERSITY OF CHICAGO

The Vocational Guidance of Youth. By MEYER BLOOMFIELD. Boston: Houghton Mifflin Co., 1911. Pp. xvi+124. $0.60.

A daring and adolescent optimism is required if we are to believe in the possibility of realizing the aims set forth in this addition to the Riverside Monographs. In broad outline, the ideal of the advocates of systematic "vocational guidance" is to fit the annual output of impulsive, mobile American youth into those occupations which are best suited to the tastes and capacities of each boy and girl. Competent advice is to be procurable whether the student leaves school early or advances in the educational scheme. Such advice is not be to left loosely to well-meaning parents, to teachers of limited outlook, or to self-made men who began their careers as messenger boys and urge everyone to go and do likewise. The "help wanted" column of the evening newspaper is no longer to be the sole refuge for the thousands of children who throw aside their books and enter the world of wage-earning. The responsibility of the school is not to end with the teaching of subjects; the school must bridge the gap between its training and the life it is preparing for. Although the pinch of the problem at present is the taking care of the fourteen-to-sixteen-year olds who leave school at the minimum point, the adjustment of child to occupation and occupation to child is to extend to all sorts of occupations—"positions," trades, and professions; perhaps we shall be obliged to oversee the fortunes of the older boys and girls up to the early twenties. Mr. Rowntree's recent study of unemployment in York has convincing data on the after-school history of boys from families in straitened circumstances: he shows how idleness and absence of control and training result in misfits and unemployables. In high schools and colleges the problem of adjustment is no less apparent.

There are difficulties theoretical and practical. Is vocational direction within the scope of the school? Can it be done? The gauntlet of criticism must be run. There are manufacturers who still demand the dexterity of childhood under the guise of helping poor widows and offering a chance to begin at the bottom of the ladder; there are school people who contend that remoteness from future practical pursuits